CLAIMS:

1. A data structure realized in a database comprising:

 a plurality of data areas in which given time series data pieces are loaded in sequence of times; and

 bookmark information areas respectively provided at predetermined locations in said plurality of data areas and each having a pair of bookmark information indicative of a time corresponding to a time series data piece loaded in each of said data areas and state transition information indicative of a state of the data piece in each data area, said state transition information being allowed to have one of a value indicative of an online state in which the data area is permitted to be retrieved and a value indicative of a loading state in which loading of data in the data area has not yet been completed and the data area is not permitted to be retrieved.

2. A data structure according to claim 1, wherein said plurality of data areas ~~have~~ each *have* a predetermined data capacity and are arranged consecutively in said database in order that said ~~plurality of~~ bookmark information areas in said plurality of data areas can be read consecutively.

3. A data structure according to claim 1, wherein the state transition information in at least one of said plurality of data areas is allowed to have one of a value indicative of an online state in which the data area is permitted to be retrieved, a value indicative of a loading

state in which loading of data in the data area has not yet
been completed and the data area is not permitted to be
retrieved and a value indicative of a state in which data
in the data area is empty.

5   4.   A data structure realized in a database
comprising:

          a plurality of data areas in which given time
series data pieces are loaded at predetermined locations,
respectively, in said database in sequence of times; and

10   predetermined bookmark information areas each
having a pair of bookmark information indicative of a time
corresponding to a time series data piece loaded in each of
said data areas and state transition information indicative
of a state of the data piece in each data area, said state

15   transition information having one of a value indicative of
an online state in which the data area is permitted to be
retrieved and a value indicative of a loading state in
which loading of data in each data area has not yet been
completed and the data area is not permitted to be

20   retrieved.

5.   A data structure according to claim 5, said
plurality of data areas have each a predetermined data
capacity and are arranged consecutively in said database in
order that said plurality of bookmark information areas in

25   said plurality of data areas can be read consecutively.

6.   A data structure according to claim 4, wherein
the state transition information in at least one of said
plurality of data areas has a value indicative of an online

state in which the data area is permitted to be retrieved,

a value indicative of a loading state in which loading of

data in the data area has not yet been completed and the

data area is not permitted to be retrieved and a value

5   indicative of a state in which data in at least one data

area is empty.

7.   A database managing method for managing data in a

database, comprising the steps of:

      adding, to a predetermined location in a given

10   time series data piece for a predetermined time, bookmark

information having bookmark information indicative of a

time corresponding to said time series data piece for said

predetermined time and state transition information

indicative of a state of said time series data piece for

15   said predetermined time;

      providing, as said state transition information,

one of a value indicative of an online state in which the

data area is permitted to be retrieved, a value indicative

of a loading state in which loading of data in the data

20   area has not yet been completed and the data area is not

permitted to be retrieved and a value indicative of a state

in which data in the data area is empty; and

      loading time series data pieces for predetermined

times in a plurality of data areas in said database in

25   sequence of times corresponding to said time series data

pieces.

8.   A database managing method according to claim 7,

further comprising the steps of:

reading, from said plurality of data areas, a plurality of bookmark information pieces each having state transition information and bookmark information in accordance with a data retrieval request applied to said

5   database by designating a time; and

detecting the bookmark information including said designated time and when the state transition information included in said detected bookmark information indicates said online state, reading a time series data piece

10   corresponding to said detected bookmark information.

9.   A database managing method according to claim 7, further comprising the step of:

when the state transition information included in said detected bookmark information indicates either a value

15   indicative of said loading state or a value indicative said empty state, determining that said data retrieval request is not responded to.

10.   A database managing method according to claim 7, further comprising the steps of:

20   reading, from said plurality of data areas, a plurality of bookmark information pieces each having state transition information and bookmark information in accordance with a data deletion request applied to said database by designating a time; and

25   detecting the bookmark information including said designated time and when the state transition information included in said detected bookmark information indicates said online state, setting a value indicative of an empty

state in said state transition information included in said
detected bookmark information.

11.   A database managing method according to claim 7,
further comprising the steps of:

~~cumulating repeatedly applied time series data~~
~~pieces in a cumulative data storage area until they reach~~
total data for said ~~predetermined time,~~ and

after said repeatedly applied time series data
pieces have been collected up to said total data for said
predetermined time, adding, to a data piece in said
cumulative data storage area, bookmark information having
bookmark information indicative of a time corresponding to
the data piece for said predetermined time and state
transition information indicative of a state of said time
series data piece for said predetermined time and loading
resulting data pieces in said plurality of data areas of
said database in sequence of times corresponding to said
time series data pieces.

12.   A database managing method for managing data in a
database, comprising the steps of:

adding, to a predetermined location in a given
time series data piece for a predetermined time, bookmark
information having bookmark information indicative of a
time corresponding to said time series data piece for said
predetermined time and state transition information
indicative of a state of said time series data piece for
said predetermined time and start area information having a

flag indicating whether the area is the final one of a plurality of areas in said database and an address area for setting an address;

providing, as said state transition information,
5   one of a value indicative of an online state in which the data area is permitted to be retrieved and a value indicative of a loading state in which loading of data in the data area has not yet been completed and the data area is not permitted to be retrieved;

10   loading time series data pieces for predetermined times in a plurality of consecutive data areas in said database in sequence of times corresponding to said time series data pieces; and

raising said flag of start area information in
15 the final one of said plurality of consecutive data areas and setting an address of first one of said plurality of consecutive data areas in said address area.

13.   A database managing method according to claim 12 further comprising the steps of:
20   adding, to a predetermined location in a time series data piece for a predetermined time applied so as to be loaded in said database, bookmark information having bookmark information indicative of a time corresponding to said time series data piece for said predetermined time and
25 state transition information indicative of a state of said time series data piece for said predetermined time;

reading all state transition information pieces in said database to detect bookmark information having the

oldest time and loading said time series data piece for

said predetermined time applied so as to be loaded in said

database in a data area corresponding to said oldest

bookmark information; and

5   updating said oldest bookmark information to said

bookmark information corresponding to said loaded data.

14.   A database managing method for managing data in a

database, comprising the steps of:

reading bookmark information having bookmark

10 information indicative of a time corresponding to a given

time series data piece for a predetermined time and state

transition information indicative of a state of said time

series data piece for said predetermined time from a

predetermined bookmark area and setting the state of said

15 time series data piece in said state transition information

to a value indicative of a state in which data is empty so

as to write said bookmark information in said database;

loading given time series data pieces for given

predetermined times in a plurality of data areas in said

20 database in sequence of times corresponding to said time

series data pieces; and

after the step of loading said data pieces has

been completed, writing bookmark information having

bookmark information indicative of a time corresponding to

25 a time series data piece for said predetermined time and

state transition information indicative of an online state

of said time series data piece for said predetermined time

in said predetermined bookmark area.

15. A database managing method according to claim 14, further comprising the step of loading time series data pieces for predetermined times in a plurality of data areas in said database in sequence of times corresponding to said

5 time series data pieces.

16. A database managing method according to claim 15, further comprising the steps of:

reading, from said plurality of data areas, a plurality of bookmark information pieces each having state

10 transition information and bookmark information in accordance with a data retrieval request applied to said database by designating a time; and

detecting the bookmark information including said designated time and when the state transition information

15 included in said detected bookmark information indicates said online state, reading a time series data piece corresponding to said detected bookmark information.

17. A database managing method according to claim 14, further comprising the step of:

20 when the state transition information included in said detected bookmark information indicates either a value indicative of said loading state or a value indicative of said empty state, determining that said data retrieval request is not responded to.

25 18. A database managing method according to claim 14, further comprising the steps of:

reading, from said plurality of data areas, a plurality of bookmark information pieces each having state

transition information and bookmark information in accordance with a data deletion request applied to said database by designating a time; and

detecting the bookmark information including said

5 designated time and when the state transition information included in said detected bookmark information indicates said online state, setting a value indicative of said empty state in said state transition information included in said detected bookmark information.

10 19.　　A database managing method according to claim 14, further comprising the steps of:

cumulating repeatedly applied time series data pieces in a cumulative storage area until ~~they~~ the cumulative data reach total data for said predetermined time; and

15 ~~after said repeatedly applied time series data pieces have been collected up to said total data for said predetermined time,~~ adding, to a data piece in said cumulative data storage area, bookmark information having bookmark information indicative of a time corresponding to

20 said data piece for said predetermined time and state transition information indicative of a state of said time series data piece for said predetermined time and loading resulting data pieces in said plurality of data areas in said database in sequence of times corresponding to said

25 time series data pieces.

20.　　A database managing system, comprising:

a processor having a memory for storing given time series data pieces for predetermined times and a clock

for reading times at which said time series data pieces are applied; and

      a database connected to said processor and having bookmark information indicative of a time corresponding to

5 a time series data piece for a predetermined time, state transition information indicative of a state of said time series data piece of said predetermined time and said time series data pieces for said predetermined times, said state transition information having one of a value indicative of

10 an online state in which the data area is permitted to be retrieved, a value indicative of a loading state in which loading of data in the data area has not yet been completed and the data area is not permitted to be retrieved and a value indicative of a state in which data in the data area

15 is empty.

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